

The Impact of Rent Increases on Different Incomes in Amsterdam-West and Amsterdam-Zuid (2017 vs. 2019)

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Set-up your environment

```
install.packages("sf")
```

```
## The following package(s) will be installed:
## - sf [1.0-21]
## These packages will be installed into "~/Documents/GitHub/Group-7/renv/library/macos/R-4.5/aarch64-a
##
## # Installing packages -----
## - Installing sf ... OK [linked from cache]
## Successfully installed 1 package in 3.8 milliseconds.
```

```
require(tidyverse)
```

```
## Loading required package: tidyverse

## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr    1.5.1
## v ggplot2    3.5.2      v tibble     3.3.0
## v lubridate  1.9.4      v tidyr      1.3.1
## v purrr      1.0.4
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
require(dplyr)
require(stringr)
require(readr)
require(sf)
```

```
## Loading required package: sf
## Linking to GEOS 3.13.0, GDAL 3.5.3, PROJ 9.5.1; sf_use_s2() is TRUE
```

```
require(ggplot2)
require(viridis)
```

```
## Loading required package: viridis
```

```
## Warning in library(package, lib.loc = lib.loc, character.only = TRUE,
## logical.return = TRUE, : there is no package called 'viridis'
```

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Tutorial 2, Group 7

Chantal Schouwenaar

Part 1 - Identify a Social Problem

1.1 Describe the Social Problem

The Impact of Rent Increases on Different Incomes in Amsterdam West vs Amsterdam Zuid

In the last few years, rent prices in the Netherlands have increased significantly, especially in cities like Amsterdam. Within Amsterdam, wijks such as Amsterdam West and Amsterdam Zuid have seen noticeable differences in how rising rents affect residents. This has made it increasingly difficult for people with low or average incomes to find affordable housing (Eichholtz, 2022).

While some people's incomes have not increased much, rents continue to rise. This means a larger portion of their income goes to rent, leaving less for essential needs like food, healthcare, or education (Custers, 2022).

Between 2017 and 2019, Amsterdam saw an increase of long-term rental homes being switched into short-term tourist lets on platforms like Airbnb, which reduced the supply of housing for residents and drove up rental prices. To oppose this the city first limited home-sharing to 60 nights per year in 2018 and then halved that limit to 30 nights in 2019, and although these rules slowed the growth of short-term lets, they came after rents had already spiked, so long-term rents continued to climb despite the new regulations. (Valente, 2023)

This is a serious issue because everyone needs a safe and affordable place to live. If rent prices keep rising, some residents may be forced to move to less desirable areas, live in smaller or lower-quality homes, or even face homelessness. By examining rent prices from 2017 to 2019 and comparing the impact on different incomes in Amsterdam West and Amsterdam Zuid, we can gain a better understanding of who is most affected. This insight is crucial for creating more effective and fair housing policies in the future.

Most studies on Amsterdam's rising only look at city-wide numbers and treat entire boroughs the same. This study focuses on the key 2017–2019 period when Airbnb really took off and new regulations were introduced, breaks the data down into small wijks in West and Zuid, and shows solid statistics to help shape fairer housing policies.

Part 2 - Data Sourcing

2.1 Load in the data

```
dataset <- read_csv("data/huurprijzen.csv")
```

```
## New names:
## Rows: 17 Columns: 10
## -- Column specification
## ----- Delimiter: "," chr
## (3): Gemiddelde huurprijs voor particuliere en corporatie huursector per... dbl
## (7): ...1, ...4, ...5, ...6, ...8, ...9, ...10
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.
## * ' ' -> '...1'
## * '...2' -> '...3'
## * '...3' -> '...4'
## * '...4' -> '...5'
## * '...5' -> '...6'
## * '...6' -> '...7'
## * '...7' -> '...8'
## * '...8' -> '...9'
## * '...9' -> '...10'
```

```
dataset_2<- read_csv("data/kerncijfers_wijken_en_buurtten_2015.csv")
```

```
## Rows: 111 Columns: 1
## -- Column specification -----
## Delimiter: ","
## chr (1): Kerncijfers wijken en buurten 2015
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
dataset_3<- read_csv("data/kerncijfers_wijken_en_buurtten_2017.csv")
```

```
## New names:
## Rows: 580 Columns: 110
## -- Column specification
## ----- Delimiter: "," chr
## (71): Wijken.en.buurten, Regioaanduiding.Gemeentenaam..naam., Regioaandu... dbl
## (39): ...1, Bevolking.Aantal.inwoners..aantal., Bevolking.Geslacht.Manne...
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.
## * ' ' -> '...1'
```

```
dataset_4<- read_csv("data/kerncijfers_wijken_en_buurtten_2019.csv")
```

```
## New names:
```

```
## Rows: 580 Columns: 118
## -- Column specification
## ----- Delimiter: "," chr
## (18): Wijken.en.buurtten, Regioaanduiding.Gemeentenaam..naam., Regioaandu... dbl
## (91): ...1, Bevolking.Aantal.inwoners..aantal., Bevolking.Geslacht.Manne... num
## (9): Bevolking.Particuliere.huishoudens.Gemiddelde.huishoudensgrootte.....
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.
## * ' -> '...1'
```

2.2 Provide a short summary of the dataset(s)

```
head(dataset)
```

```
## # A tibble: 6 x 10
##   ...1 Gemiddelde huurprijs v~1 ...3   ...4   ...5   ...6 ...7   ...8   ...9 ...10
##   <dbl> <chr>                <chr> <dbl> <dbl> <dbl> <chr> <dbl> <dbl> <dbl>
## 1     1 <NA>                <NA>   NA    NA    NA <NA>   NA    NA    NA
## 2     2 <NA>                gemi~   NA    NA    NA <NA>   NA    NA    NA
## 3     3 <NA>                part~   NA    NA    NA corp~   NA    NA    NA
## 4     4 stadsdeel        2013   2015   2017   2019 2013   2015   2017   2019
## 5     5 <NA>                <NA>   NA    NA    NA <NA>   NA    NA    NA
## 6     6 A Centrum        693    807    910   1010 443    464    509    538
## # i abbreviated name:
## #   1: 'Gemiddelde huurprijs voor particuliere en corporatie huursector per stadsdeel, 2013-2019 1)'
```

The first data-set is an Excel sheet with the rent prices of every district of Amsterdam over the years 2013, 2015, 2017, 2019 both from particular and corporate. This is a credible source because the rent series comes directly from the City of Amsterdam's official rental register. The second dataset is a csv file with all the neighborhoods of Amsterdam with all types of different variables, such as the population per neighborhood, types of houses, incomes and incomes of different groups, etc. This is a credible source because it comes from CBS, a well trusted source also CBS data is seen as a gold-standard source for understanding economic and social trends in the Netherlands.

2.3 Describe the type of variables included

Income-related variables:

- Average income per income receiver in x1000, we chose this variable because it was available over multiple years and shows how much an average household is able to spend.

These income data are not self-reported but derived from administrative sources. Statistics Netherlands (CBS) compiles income information using tax returns and government administrative records (e.g., benefits and allowances), calculating the disposable income per household. Each household's income is linked to their residential address to allow geographic comparison at the district level (Centraal Bureau voor de Statistiek, 2025).

Housing-related variables:

- Average rent prices, specified for two contrasting districts in Amsterdam: Amsterdam-West (relatively affordable) and Amsterdam-Zuid (relatively expensive).

Data originate from the Basisbestand Gebieden Amsterdam (BBGA), which is based on administrative municipal records (e.g., WOZ values, rental data) (Gemeente Amsterdam, 2023). Additional housing data

were drawn from WiMRA, a survey-based source covering household characteristics, preferences, and mobility in the Amsterdam metropolitan region (*Dataset: Woningmarkt, 2025*).

Constructed variables:

Rent burden: Calculated as $(\text{average rent} / \text{average income}) \times 100\%$, this variable expresses the burden of rent in relation to income.

Affordability pressure: Calculated as $(\text{rent increase \%} - \text{income growth \%})$. A positive value indicates that rent is growing faster than income, signaling worsening affordability.

The rent data file covers four specific years at the broader district level, showing how rents shifted over time in areas like West and Zuid. The CBS is a single year, look at who lives in each neighborhood and what they earn. By combining them, we can link the big rent trends to the real income and housing profiles of local residents.

The selected data-sets provide a balanced combination of objective and subjective information, allowing for a nuanced analysis of both economic affordability and perceived housing conditions. Using Amsterdam-West and Amsterdam-Zuid as contrasting districts supports a clear comparison between relatively affordable and expensive housing areas.

While these data sources offer valuable insights, they also come with certain limitations. One key issue is timeliness, as administrative records may be subject to delays in reporting, which can reduce their relevance in a fast-evolving housing market. Moreover, the survey data's representativeness can be affected by non-response bias or insufficient coverage of specific demographic groups, despite the extensive scope of WiMRA. The level of detail is another constraint since the data is presented at an aggregated district or neighborhood level, potentially overlooking important variations at smaller geographic scales, such as individual streets or blocks. Lastly, the derived indicators, such as rent quota and affordability pressure, are based on averages, which may mask the wide range of experiences and disparities among different households.

Part 3 - Quantifying

3.1 Data cleaning

For the CBS data-set, we created the income variables by selecting and combining all wijken in Amsterdam-West and Zuid, then cleaned and converted the income field to numeric, handled missing values, and calculated average income per neighborhood for 2015, 2017, and 2019. In parallel, we loaded the rent data, removed unnecessary rows, kept only West and Zuid districts, renamed columns for clarity, selected private-sector rent prices, recoded district names to match the CBS data, and standardized all column names. We then merged the two tables with a left join on wijk and year this preserved every income observation even if a rent record was missing, ensuring no wijk was dropped due to incomplete rent data. In an ideal world, the rent dataset would cover all boroughs instead of just West and Zuid so it would match the income dataset's full scope.

3.2 Generate necessary variables

Variable 1: Rent burden: Calculated as $(\text{average rent} / \text{average income}) \times 100\%$, this variable expresses the burden of rent in relation to income.

Rent burden For the temporal analysis we used rent burden per borough. Therefore we used the averages we calculated.

For the spatial analysis we uses rent burden per wijk. Therefore we calculated that one per wijk that belonged to each district.

Variable 2: Affordability pressure

Affordability pressure: Calculated as $(\text{rent increase \%} - \text{income growth \%})$. A positive value indicates that rent is growing faster than income, signaling worsening affordability.

For the affordability pressure we combined the percentage change of rent increase and the percentage change of income, to not only look at how the rent rose but if it outpaces the income gains. We intend to use this for visualization charts event analysis.

3.3 Visualize temporal variation

How has rent burden evolved from 2017 to 2019 in West vs. Zuid?

We'll plot survey year on the x-axis and rent quota on the y-axis, drawing two colored lines one for West and one for Zuid so you can see how rent burden evolved over time between 2017 and 2019. By placing time on the horizontal axis and clearly labeling each district, the chart directly aligns with our question about temporal variation in affordability stress, revealing exactly when and by how much Zuid's rent burden outpaced West's.

3.4 Visualize spatial variation

How does rent burden vary across neighborhoods in Amsterdam West vs. Zuid?

We'll use the official Amsterdam wijk shapefile to draw West and Zuid at just the right scale zoomed in enough to show every wijk but not so far out that details get lost and shade each area by its rent-to-income ratio. A brief caption will explain that darker colors mark the highest rent burden, directly tying the map back to our question about where affordability stress is worst. By relying on accurate spatial data, appropriate zoom, and clear labels, the map will make it easy to spot the neighborhoods that need the most support.

3.5 Visualize sub-population variation

Which neighborhoods carry the heaviest rent burden, and how does this differ in West vs. Zuid?

We'll draw side-by-side box-plots of each neighborhood's rent-to-income ratio, grouping boxes by wijk and coloring them by borough (West vs Zuid), then facet the entire plot into two panels one for West, one for Zuid. This setup treats each borough as a sub-population, so you can directly compare how rent burden distributions (medians, IQRs, and upper tails) differ across neighborhoods and between boroughs. A concise caption will explain that taller boxes and longer upper whiskers signal where affordability stress is most severe, tying the visualization back to our question about which neighborhoods and which sub-populations carry the heaviest rent burden.

3.6 Event analysis

What happened to rent burden growth when Airbnb caps came in (2018 and 2019)?

We'll plot a timeline of the year-over-year percent change in rent burden (y-axis) across survey years and mark the two key events mid-2018 and January 2019 Airbnb cap implementations with vertical lines and labels. By placing those events directly on the same chart as the percent-change values, we can see if the slope of the line flattens or dips immediately afterward. If the growth rate in rent burden noticeably slows following the caps, it suggests those regulations had a tangible impact on easing affordability pressure demonstrating how policy can shift housing-cost dynamics over time.

Part 4 - Discussion

4.1 Discuss your findings

Between 2017 and 2019, rising rent prices in Amsterdam revealed growing inequalities between districts, particularly Amsterdam-West and Amsterdam-Zuid. By combining rent statistics with income data, we were able to accurately assess the housing cost burden, defined as the percentage of household income spent on rent, across different incomes in different areas. This approach allowed us to evaluate how rent increases affected various segments of the population.

Our analysis shows that the rent burden increased in both districts during this period. However, the rise was more pronounced in Amsterdam-Zuid, where rent levels were already significantly higher than in other areas. As a result, even households in higher-income brackets began to experience relatively greater financial pressure. This contrasts with Amsterdam-West, where although the rent burden also grew, it did so at a more moderate pace, suggesting a relatively less severe impact.

The spatial distribution of rent burden revealed further disparities. In Amsterdam-West, the burden is more evenly spread across neighborhoods, with many areas maintaining levels close to or below 30%, a threshold generally considered manageable. In Zuid, however, certain neighborhoods exhibited extremely high rent burdens, in some cases approaching or exceeding 40%. These findings point to serious affordability issues, even in districts traditionally viewed as wealthy.

Further insights come from our sub-population analysis using wijk-level boxplots. This analysis revealed that the variation in rent burden is greater in Zuid than in West, indicating deeper internal inequalities. In Zuid, some neighborhoods experience low rent burdens, likely due to very high local incomes, while others face steep housing costs. In contrast, the range of rent burden values in West is narrower, pointing to a more balanced and stable situation for its residents.

Our event analysis focused on the introduction of Airbnb regulations in 2018 and 2019. These policies, which limited the number of rental nights, were associated with a slight slowdown in the rising rent burden. However, this deceleration was not substantial enough to counteract the sharp increases that had already occurred. This suggests that while the regulations were a step in the right direction, they came too late to reverse the broader trend of declining affordability.

Finally, the affordability pressure indicator further illustrates the depth of the crisis. In many neighborhoods, rent rose at a faster pace than income. This was especially evident in West, where income growth remained limited. In Zuid, income levels increased slightly more, but still failed to keep up with the high absolute rent costs. As a result, average- and low-income households across both districts are increasingly at risk of displacement, forced relocation and even homelessness, underscoring the urgent need for targeted housing policy interventions.

Part 5 - Reproducibility

5.1 Github repository link

Provide the link to your PUBLIC repository here: <https://github.com/elakyc15/Group-7>

5.2 Reference list

Custers, G. (2022). De wooncrisis in Nederland: voorbij het idee van ‘natuurverschijnsel’. *Tijdschrift Sociologie*, 3(0). <https://doi.org/10.38139/ts.2022.27>

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Centraal Bureau voor de Statistiek. (2025). *Kerncijfers wijken en buurten 2022* [Data set]. Retrieved June 4, 2025, from <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/85318NED/table?ts=1749040045409> (opendata.cbs.nl)

<https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84583NED/table?ts=1749115541907>

Dataset: Woningmarkt | Website onderzoek en statistiek. (z.d.).

<https://onderzoek.amsterdam.nl/dataset/woningmarkt-amsterdam>

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Dataset: Basisbestand Gebieden Amsterdam (BBGA) | Website Onderzoek en Statistiek. (n.d.). <https://onderzoek.amsterdam.nl/dataset/basisbestand-gebieden-amsterdam-bbga>